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TRACT

The United States Training and Employment Service eral Aptitude Test Battery (GATB), first published in 1947, has n included in a continuing program of research to validate the ts against success in many different occupations. The GATB sists of 12 tests which measure nine aptitudes: General Learning lity; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form ception; Clerical Perception; Motor Coordination; Finger terity; and Manual Dexterity. The aptitude scores are standard res with 100 as the average for the general working population, a standard deviation of 20. Occupational norms are established in ns of minimum qualifying scores for each of the significant itude measures which, when combined, predict job performance. ting scores are set only for those aptitudes which aid in dicting the performance of the job duties of the experimental ple. The GATB norms described are appropriate only for jobs with tent similar to that shown in the job description in s report. A description of the validation sample is included.

Technical Report on Development of USTES Aptitude Test Battery

For . . . .

Knitting-Machine Fixer, Socks (hosiery) 689.280

S-91R

(Developed in Cooperation with the West Virginia and Maryland State Employment Services)

U.S. Department of Labor
Manpower Administration

June 1970

FOREWORD

The United States Training and Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination, predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

GATB Study #2107

Development of USTES Aptitude Test Battery

for

Knitting-Machine Fixer, Socks (hosiery) 689.280-010

S-91R

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Knitting-Machine Fixer, Socks (hosiery) 689.280-010. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
N - Numerical Ability	75
S - Spatial Ability	80
F - Finger Dexterity	75

Research Summary

Sample:

51 male workers employed as Knitting-Machine Fixers in West Virginia and Maryland. This study was conducted prior to the requirement of providing minority group information. Therefore, minority group status is unknown.

Criterion:

Supervisory ratings.

Design:

Concurrent (test and criterion data were collected at approximately the same time).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, aptitude-criterion correlations and selective efficiencies.

Concurrent Validity:

Phi Coefficient = .39 ($P/2 < .005$)

Effectiveness of Norms:

Only 71% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 83% would have been good workers. Twenty-nine percent of

the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 17% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

TABLE I

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	71%	83%
Poor Workers	29%	17%

SAMPLE DESCRIPTION

Size:

N = 51

Occupational Status:

Employed Workers.

Work Setting:

Workers were employed by the Interwoven Stocking Company at Berkeley Springs and Martinsburg, West Virginia, and at Hagerstown, Maryland.

Employer Selection Requirements:

Education: None Required. Grammar school preferred.

Previous Experience: None required.

Tests: None used.

Other: Personal interview, eye examination, and physical examination.

Principal Activities:

The job duties for each worker are comparable to those shown in the job description in the Appendix.

Minimum Experience:

All workers in the final sample had at least four years job experience.

TABLE 2

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, Experience and Cultural Exposure.

	Mean	SD	Range	r
Age (years)	39.8	7.4	23-52	.068
Education (years)	9.2	2.0	6-13	-.012
Experience (months)	185.1	70.2	48-312	.211

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002A, were administered March and August of 1955.

CRITERION

The criterion consisted of supervisory ratings. At the Martinsburg plant, a joint rating was made by the plant superintendent and assistant plant superintendent, the only two men who were familiar with all the workers. It was believed that the joint rating would be at least as reliable as an independent rating by each of these supervisors. The ratings of the Berkeley Springs and the Hagerstown groups were prepared by the branch manager in charge of both plants, since he was the only person familiar with all the workers. Each worker was rated on the quality and quantity of work performed. Each rater, or raters, ranked the workers in his plant in the order of their ability and divided them into three categories - above average, average, and below average. Supervisory personnel were well informed in regard to reasons for providing a valid criterion and the necessity for honest evaluations of each employee's work performance. Great care was exercised by the supervisory personnel in arriving at the final ratings and the criterion is considered a valid measure of success on the job. For statistical analysis, the broad category ratings for workers at the three plants were combined and converted to quantitative scores. The above average group with 18 workers, the average group with 18 workers, and the below average group with 15 workers received scores of 61, 49, and 38, respectively. The employment manager, who was a machine fixer himself at one time, knew all the workers in each plant. After a cursory examination of the ratings, he indicated that he would have grouped them in the same manner. Based on this, no reratings were obtained.

Criterion Dichotomy:

The criterion distribution was dichotomized into low and high groups by placing 20% of the sample in the low group to correspond with the percentage of workers considered unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers." The criterion critical score is 49.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Aptitudes F and M which do not have high correlations with the criterion, were considered for inclusion in the norms because the qualitative analysis indicated that the aptitudes might be important for the job duties and the sample had relatively high mean scores on these aptitudes. Tables 3, 4 and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on the job analysis, the aptitudes indicated appear to be important to the work performance)

Aptitudes	Rationale
G - General Learning Ability	Required in learning the various phases of this skilled occupation, in exercising judgment to determine causes of malfunctioning and in following detailed written instructions and oral instructions in repair of machines.
S - Spatial Aptitude	Required in visualizing working parts of machines and relating a diagram and/or blueprints to the parts.
P - Form Perception	Required in visually inspecting socks to determine if machine is knitting properly.
F - Finger Dexterity	Required in repairing and adjusting machines.
M - Manual Dexterity	Required in working with small and large parts.

TABLE 4

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N = 51

	Mean	SD	Range	r
G - General Learning Ability	94.5	15.2	66-132	.325*
V - Verbal Aptitude	93.1	14.1	63-135	.277*
N - Numerical Aptitude	91.1	15.4	65-122	.283*
S - Spatial Aptitude	94.0	16.2	58-127	.378**
P - Form Perception	86.5	17.7	40-131	.329*
Q - Clerical Perception	90.3	13.8	60-122	.247
K - Motor Coordination	88.6	15.2	55-124	.140
F - Finger Dexterity	100.4	15.7	69-139	-.037
M - Manual Dexterity	98.9	22.2	50-174	-.168

*Significant at the .05 level
**Significant at the .01 level

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
Job Analysis Data	G	V	N	S	P	Q	K	F	M
Important			X	X	X			X	X
Irrelevant									
Relatively High Mean	X			X				X	X
Relatively Low Standard Dev.		X				X			
Significant Correlation with Criterion	X	X	X	X	X				
Aptitudes to be Considered for Trial Norms	G	V	N	S	P			F	M

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of the degree to which trial norms consisting of various combinations of aptitudes G, V, N, S, P, F and M at trial cutting scores were able to differentiate between the 71% of the sample considered to be good workers and the 29% of the sample considered to be poor workers. Trial cutting scores at five-point intervals approximately one standard deviation below the mean are tried because this will eliminate about one-third of the sample with three-aptitude norms. For four-aptitude trial norms, cutting scores of slightly less than one standard deviation below the mean will eliminate about one-third of the sample; for two-aptitude trial norms, minimum cutting scores of slightly more than one standard deviation below the mean will eliminate about one-third of the sample. The phi coefficient was used as a basis for comparing trial norms. Norms of N-75, S-80, and F-75 provided optimim differentiation for the occupation of Knitting Machine Fixer, Socks (hosiery) 689.280-010. The validity of these norms is shown in Table 6 and is indicated by a phi coefficient of .39 (statistically significant at the .005 level).

TABLE 6

Concurrent Validity of Test Norms
N-75, S-80, and F-75

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	6	30	36
Poor Workers	9	6	15
Total	15	36	51

Phi coefficient = .39

Chi square (X^2y) = 7.6

Significance level = $P/2 < .005$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study met the requirements for incorporating the occupation studied into OAP-35 which is shown in Section II of the Manual for the General Aptitude Test Battery. A Phi Coefficient of .21 is obtained with the OAP-35 norms of N-85, S-95, and F-80.

FACT SHEET

Job Title

Knitting-Machine Fixer, Socks (hosiery) 689.280-010

Job Summary

Adjusts, repairs and replaces the parts of a block of knitting machines used in knitting men's seamless socks. Determines, by examination of the production of the machines, if any adjustments or repairs to the machines are necessary; makes adjustments and partially dismantles machines to repair broken or worn parts; replaces broken needles. May uncrate and set up new machines, prepare old machines for shipment, repair broken parts, make new parts and install attachments. May set up machines for new patterns from the style chart furnished by styling department. May remove or replace links to make change in size of sock and may make yarn changes.

Effectiveness of Norms

Only 71% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the S-91R norms, 83% would have been good workers. Twenty-nine percent of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the S-91R norms, only 17% would have been poor workers.

Applicability of S-91R Norms

The aptitude test battery is applicable to jobs which include a majority of duties described above.

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